

# Instrument Catalog

2013 - 2014



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## SPE-01 Cleanup Station

**SPE-01 solid phase extraction system** is designed for automatic sample cleanup in analysis of food and environmental samples. It can be used for pesticide residue and drug residue analysis in food samples and for analysis of pollutants in soil samples. SPE-01 can automatically fulfill all the necessary actions for solid phase extraction and column chromatographic cleanup, such as conditioning of columns, sample loading, washing, and fraction collection. By providing constant flow rate and well controlled elution procedures, SPE-01 helps to improve quality and efficiency of trace analysis and release chemists from tedious sample preparation routines.

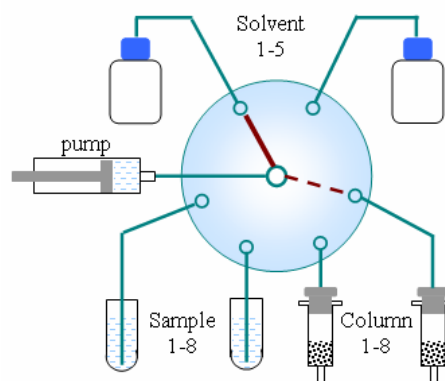
SPE-01 provides two configurations to fit the sample throughput needs. SPE-01-I handles 8 samples one by one (single channel design), whereas SPE-01-II processes 8 samples in a parallel mode (8 channel design).



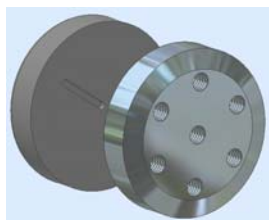
### 1. Working principle of SPE-01

The following diagram illustrates the working principle of SPE-01-I

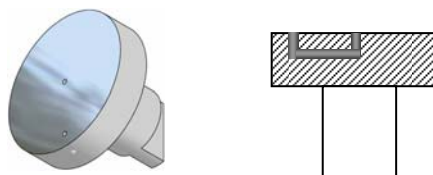
SPE-01-I use a stream selection valve and a syringe pump to transfer elution solvents or sample liquid to the SPE columns. Although all the samples share the same syringe pump and the valve, cross contamination is avoided as the flow path in the valve and the syringe pump are continuously washed during the elution procedures. Besides, the instrument has built in clean procedures to wash the tubing for samples and the flow path automatically, to make sure all the sample contacting surface is fully cleaned.



The flow path in the valve is specially designed so that the sample liquid has minimum contact with the stator surface when the valve is turning. This feature is very helpful for avoiding contamination of sticky compounds (such as benzopyrene) on the surface of the stator.

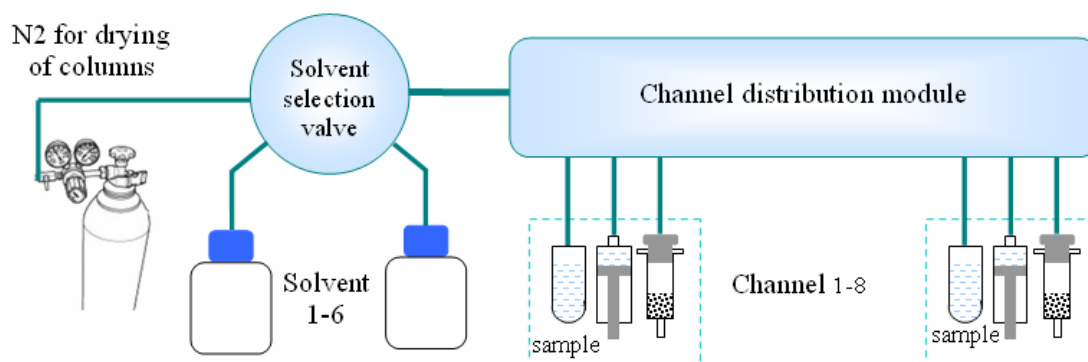


flow path in a Conventional selection valve



Flow path for the valve used in SPE-01

As shown in the diagram below, the major components of SPE-01-II are a stream selection valve and a channel distribution module. Each channel is arranged closely and each sample has isolated flow path, removing possibilities of cross contamination.



## 2. Features

### 2.1 Easy operation

SPE-01 uses built-in methods. They can be easily edited. The operation of instrument involves only 7 buttons. Below is a typical routine operation procedure:

- Place sample tubes and add samples
- Install columns and collection tray
- Select method
- Press the start/stop button.

The instrument will process the samples automatically according to the selected method.



The screen indicates samples 1 to 4 are being processed using method 1. The total volume per sample is 150.0 mL and 140 mL has been processed. Currently the instrument is running the step of elution using solvent 2.

## 2.2 Column blockage detection and smart handling

The system can detect the blockage of SPE column and reduce the flow rate accordingly. If blockage still occur, the instrument will pause to wait for human attendance.

## 2.3 Small footprint and simple structure

Normal automated SPE instruments involves many switching valves and complex tubing connections. A multi channel SPE is normally heavy and of large size. The tubing connection is also complex, making maintenance difficult.

Thanks to the flow-path-integration technique, the weight and dimension of SPE-01 are around half of other multi channel SPE instruments. The weight of a SPE-01-II is only 12 kg.

## 2.4 Adaption of various SPE columns

SPE-01 adopts an innovative general purpose adapter to deal with variations in diameter of SPE columns. The adapters can be easily adjusted when different type columns are used.



## 2.5 Automatic wash of sample tubing

To prevent cross contamination, function for cleaning of sample tubing is built into the methods. After loading sample then tubing will be washed automatically using solvent. It is followed by air purge to remove leftover solvents. As the wash direction is opposite to the loading direction, the small particles accumulated on sample filters are effectively removed. As this function is in the methods, it is not necessary to wash the tubing separately after the extraction.

## 2.6 Easy transfer of existing manual methods

Below is an example of methods for SPE-01:

Line #	Action	Flow rate	Volume
1	Elute 2	15	5.0
2	Elute 1	15	10.0
3	Add samp	6	20.0
4	Elute 2	6	5.0
5	Collect 1	6	5.0
6	Elute 3	10	10.0
7	Collect 2	6	10.0

The format is very similar to manual methods. Any manual procedure for column cleanup can be conveniently transferred to an instrument method.

### 3. Applications

#### 3.1 Column cleanup for analysis of drug and pesticide residues in food samples

Traditional column cleanup uses glass columns packed with silica gel, alumina, or Florisil. Now pre-packed solid phase extraction cartridges are getting popular.

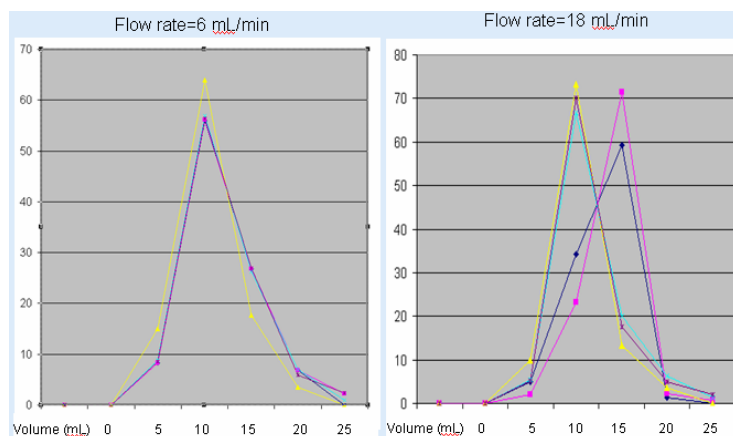
A typical clean up method involves pre-conditioning of column using a strong solvent (such as acetone) followed by a weak solvent (such as hexane). After adding the sample, columns are first eluted with a weak solvent to remove lipids and other low polarity components from sample matrix. The strength of elution solvents can then be increased stepwise. In handling multi-residue analysis, pesticides of different polarity may be collected into two fractions. Existing methods can be easily modified and used for SPE-01 plus automation process.

Since it is hard to control the flow rate and volume of solvents, the repeatability of manual SPE is not satisfactory and is mainly used for simple clean up. SPE-01 can control flow rate accurately and helps to improve reproducibility of the analysis. With SPE-01, users can do multi step elution using up to 5 solvents. Therefore, the instrument is very useful for the clean up of complex samples and especially for the simultaneous analysis of multi-residues.

#### 3.2 Accelerated elution (Flash column chromatography)

The flow rate in manual column cleanup is limited by gravity and particle size of the sorbent. In addition to unstable flow rate, the elution cannot be accelerated. In organic synthesis field, column chromatographic purification has seen a drastic improvement after introduction of flash HPLC which uses higher flow rate and sorbent of smaller particles. However this technique is seldom used for sample cleanup in trace analysis due to the lack of suitable automated cleanup instruments.

The performance of the pump in SPE-01 is comparable to the pump used in a flash LC. It can deliver a flow rate up to 50 mL/min. The high output pressure also allows to use smaller particles (10-20  $\mu\text{m}$ ) to improve the column efficiency. Below is an example of its application for pesticide residue cleanup in tea.



Elution pattern of 5 pyrethroid insecticides on column packed with 3 gram florisil (fenpropathrin, cyhalothrin, cypermethrin, fenvalerate, deltamethrin).

As shown in the above figures, elution pattern at 18 mL/min is similar to that at 6 mL/min (near the flow rate in manual column cleanup). A much faster elution speed can be achieved in automated column cleanup.

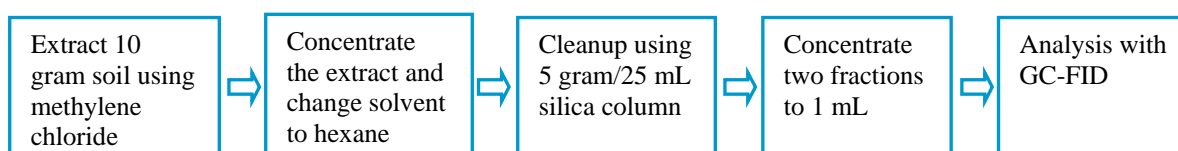
Currently the particle size of packing material for SPE cartridges and column chromatographic cleanup is normally of 40  $\mu$ m and above. Although it is known that a smaller particle gives better separation efficiency and reduces elution volume in chromatography, it is not practical in manual operation as the liquid will have problem flowing out. With the introduction of SPE-01, it becomes possible to use columns with smaller particles.

### 3.3 Cleanup for analysis of extractable petroleum hydrocarbons (EPH) in soil

The New Jersey Department of Environmental Protection (NJDEP) released a method for analysis of extractable petroleum hydrocarbons (EPH). It can be used for separate quantification of aliphatic and aromatic hydrocarbons in environmental samples (water, soil, sediment and sludge). The method involves extraction of sample using methylene chloride, cleanup using silica gel column, and determination with GC-FID. The column cleanup is complex and time consuming due to multiple elution steps, large elution volume, and multiple fraction collections.

Since the cleanup uses a very large column (5 gram/ 25 mL) and the process volume is also large (each sample needs two fractions with volume up to 50 mL), most automated SPE on the market cannot meet the needs. SPE-01 provides a perfect solution for this application. As an added advantage, SPE-01's design can tolerate the small particles from the sample matrix and aggressive solvents used for the elution.

Below is the sample preparation procedures:



Corresponding method for SPE-01. Solvent 1 = Hexane; solvent 2 = methylene chloride

Step	Action	Flow rate (mL/min)	Volume (mL)	Remarks
0	Elute 1	10	10.0	Condition column with 10 mL hexane
1	Blow air	10	5.0	Blow dry sorbent to avoid sample dispersion
2	Add samp	5	5.0	Exhaustic loading of 1 mL sample in the sample vial
3	Elute 1	10	1.0	Change elution solvent to hexane
4	Collect 1	5	15	Continue elute with hexane and collect 15 mL fraction (contains aliphatic hydrocarbon)
5	Elute 2	10	0.5	Change elution solvent to methylene chloride
6	Collect 2	10	30	Continue elute with methylene chloride and collect 30 mL fraction (contains aromatic hydrocarbon)

PromoChrom Instruments – SPE-01

#### 4. Specifications

	<b>SPE-01-I</b>	<b>SPE-01-II</b>
Sample capacity	8 per batch (one by one mode)	8 per batch (parallel mode)
Volume of sample	1 to 50 mL	1 to 50 mL
Material of wetted parts	Teflon, 316 stainless steel, Pyrex glass	Teflon, 316 stainless steel, Pyrex glass
System control	Microcontroller with keypad data entry	Microcontroller with keypad data entry
Method	Permanent storage of three methods with instrument	Permanent storage of three methods with instrument
Method functions	Pre condition, load sample, elution with 5 solvents, wash of sample line, fraction collection.	Pre condition, load sample, elution with 5 solvents, wash of sample line, drying with nitrogen, fraction collection.
Pump flow rate	0.5 to 85 mL/min	0.5 to 85 mL/min
Pressure limit of pump	6 bar	6 bar
Pump reproducibility (C.V.%)	<1.5	<1.5
Power consumption	< 1.0 A at 24 VDC	< 1.5 A at 24V DC
Weight (Kg)	11.5	12.5
Dimension (cm)	34 x 34 x 45 (width x depth x height)	34 x 34 x 45 (width x depth x height)

#### 5. Order information

<b>Part No.</b>	<b>Description</b>	<b>Price (US\$)</b>
SPE-01-01	Includes SPE-01-I mainframe, 24V power supply, and user manual.	
SPE-01-02	Includes SPE-01-II mainframe, 24V power supply, and user manual.	

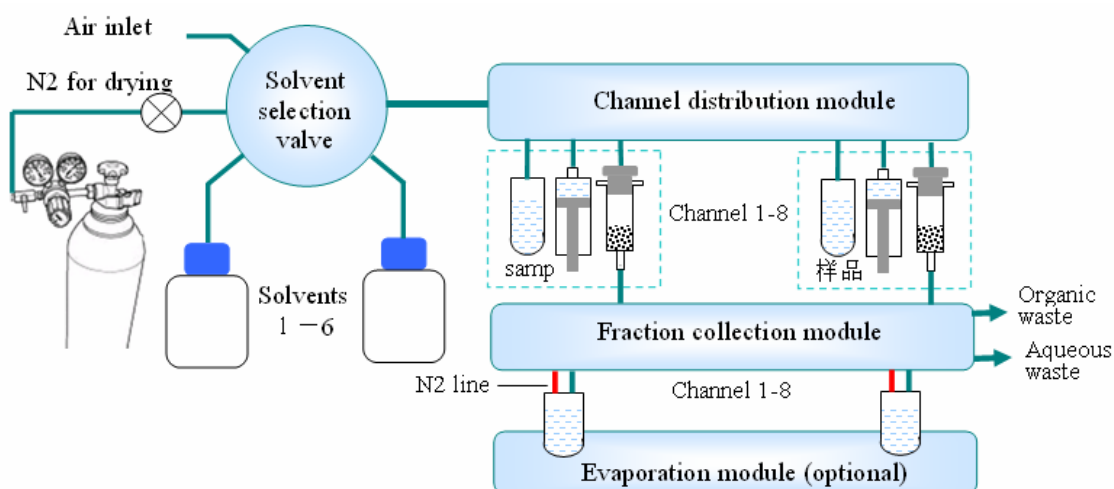


## SPE-03 Multi-Channel Cleanup Station

SPE-03 is the most versatile and fast sample preparation system. It can process up to 8 samples simultaneously. The sample volume ranges from 0.1 mL to 4000 mL. SPE-03 also provide synchronized evaporation during the fraction collection. Thanks to the flow-path-integration technique, SPE-03 has a simple structure, reliable performance, and more reasonable price.

### 1. Working principle of SPE-03

The following diagram illustrates the working principle of SPE-03:



As shown in the above diagram, the functions of SPE-03 are integrated into 3-4 modules. It does not need other stream selection valves or 3-way solenoid valves. The tubing layout is also very simple.

### 2. Features

#### 2.1 Easy operation

SPE-03 uses built-in methods for automatic extraction. The methods can be easily edited and saved for repeated use. The operation of instrument involves only 7 buttons. Below are typical routine operation procedures:

- Place sample inlet probes in samples
- Place columns and receiving containers
- Select method
- Press start/stop button



PromoChrom Technologies – SPE-03

## 2.2 Blockage detection and smart handling

The system can detect the blockage and reduce the flow rate accordingly. If blockage still occurs at the minimum flow rate, the instrument will pause and wait for human attendance.

## 2.3 Small footprint and computer-free operation

The instrument has a very small footprint and does not need a computer. For a 8-channel SPE-03, the weight is below 13 Kg. The elution solvents are placed on the top of the instrument. The compact design helps to save precious laboratory space.

## 2.4 Accommodate various columns and sample/fraction containers

SPE-03 uses a general purpose adapter to fit columns of various size, ranging from 1 to 24 mL. It is not necessary to use other caps or adapters. Various containers (such as Erlenmeyer flasks, flasks for rotary evaporators, and test tubes) can be used for samples and fractions. It helps to reduce liquid transfer for the following sample preparation procedures. The containers can all be capped to prevent solvent evaporation.



## 2.5 Integrated online evaporation

SPE-03 has a built-in evaporation module as an option. It can perform evaporation while the instrument is doing fraction collection. By controlling the speed of elution an evaporation, a large volume fraction can be collected into a 1.5-mL auto sampler vials directly.

## 3. Applications

### 3.1 Extraction of pollutants in large volume water samples

A recovery test of 8 triazole pesticides in water was carried using both conventional manifold extraction and a SPE-03 automated SPE. A volume of 750 mL tap water was spiked with the 8 pesticides at 1 ppb level and extracted using 500-mg/6-mL PCTsil C18 cartridges. The methods of SPE-03 is as follows:

Step	Action	Flow rate (mL/min)	Volume (mL)	Remarks
0	Elute 1	10	10.0	Condition column with 10 mL methanol
1	Elute 2	10	10.0	Condition column with 10 mL water
2	Add samp	10	750.0	Load 750 mL sample
3	Elute 2	10	10.0	Wash SPE column with water
4	Blow air	20	40	Purge away water from the SPE column
5	Elute 3	10	0.3	Change elution solvent to ethyl acetate
6	Collect	10	10	Elute with ethyl acetate and collect a 10-mL fraction.

The volume of collected fraction was reduced to 1 mL and analyzed using a GC-MS system. The procedures extraction using a vacuum manifold are similar to the SPE-03 method. The flow rate is controlled in similar range or slower by adjusting the vacuum.

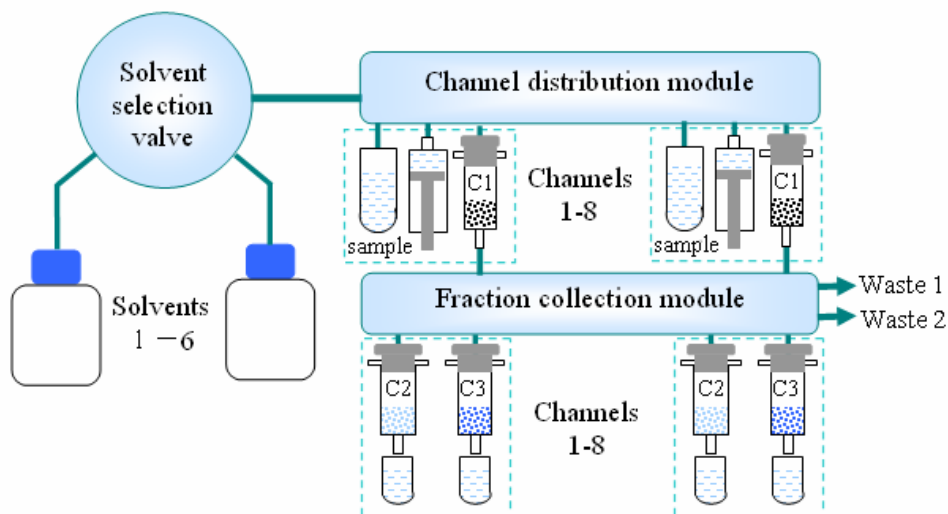
Recovery test results of 8 triazole pesticides in tap water

Pesticides	Recovery		Standard Deviation (n=3, %)	
	Manual	Automated	Manual	Automated
Triadimefon	76	99	14	6
Paclobutrazol	83	97	14	6
Hexaconazole	88	100	14	5
Uniconazole	83	93	13	5
Myclobutanil	77	95	10	5
Flusilazole	90	93	5	6
Propiconazole	83	101	15	7
Tebuconazole	82	93	6	4

Due to a well controlled flow rate, SPE-03 gives a much better recovery and reproducibility.

### 3.2 Cleanup for pesticide residues using multiple columns

SPE-03 provides a powerful platform for sample cleanup in pesticide residue analysis. In addition to all the capabilities of the SPE-01, SPE-03 can use multiple columns for multi residue cleanup.



As shown in the above diagram, 3 columns are used for each sample. Samples are first loaded to column C1. The effluent from column C1 can be diverted to waste, to column C2 or column C3. This setup provides capability for very complex samples.

#### 4. Specifications

Sample capacity	4, 6, or 8 per batch
Volume of sample	1 to 4000 mL
Material of wetted parts	Teflon, PEEK, Pyrex glass
System control	Micro controller with LCD and keypad
Method	Permanent storage of three methods
Method functions	Pre condition, load sample, elution with 5 solvents, blow dry of sorbent, fraction collection.
Pump flow rate	1 to 85 mL/min
Pressure limit of pump	6 bar
Pump reproducibility (C.V.%)	<1.5
Temperature of evaporation	Ambient to 90 degrees
Power supply	24 VDC
Current	< 1 A
Weight	13 Kg
Dimension (cm)	34 x 34 x 45cm (width x depth x height)

#### 5. Ordering Information

Part Number	Description	Price (US\$)
SPE-03-01	Includes 4-channel SPE-03 mainframe, 24V power supply, and user manual	
SPE-03-02	Includes 8-channel SPE-03 mainframe, 24V power supply, and user manual	
SPE-03-03	Includes 6-channel SPE-03 mainframe, 24V power supply, and user manual	
MOD-001	Module for online fraction evaporation	

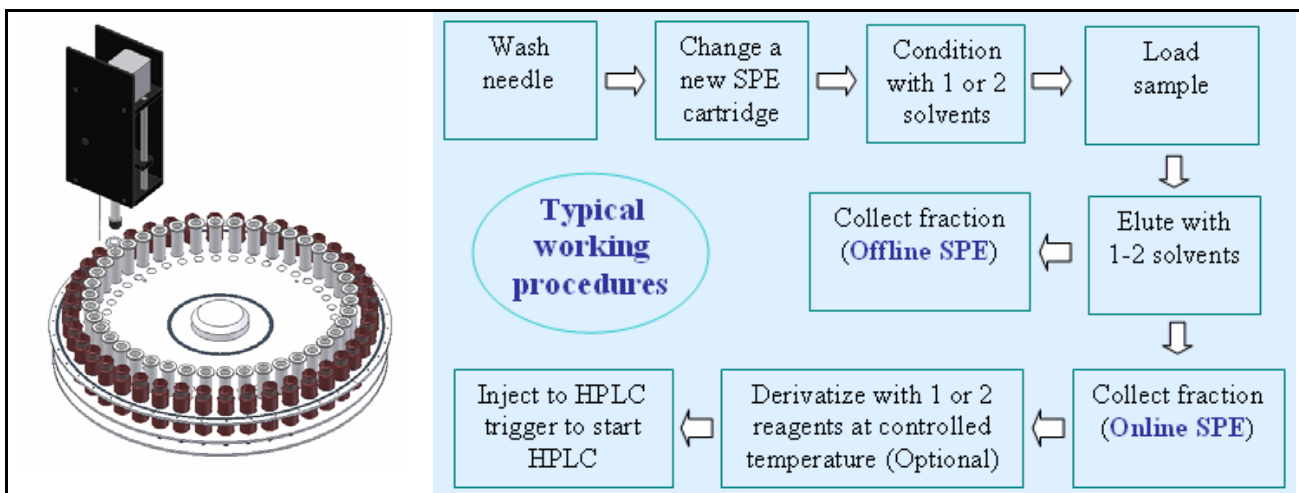
## SPE-04 multi functional solid phase extraction system

**SPE-04 multi functional solid phase extraction system** is a flexible and versatile platform for automatic sample preparation. It can perform multiple tasks: offline solid phase extraction, online solid phase extraction, normal sample injection, and online derivatization with controlled temperature. It is designed for automatic cleanup of biological samples (such as small molecules in plasma and urine samples). Compared to SPE-01, SPE-04 has smaller sample volume and fraction volume and can process much larger number of samples per batch.



### 1. Working principle of SPE-01

The following diagrams describe the structure and typical working procedures of SPE-04. The plunger for SPE column can seal the column well. It can work with SPE columns from most suppliers. There is no need for a special cap or adapter.



## 2. Features

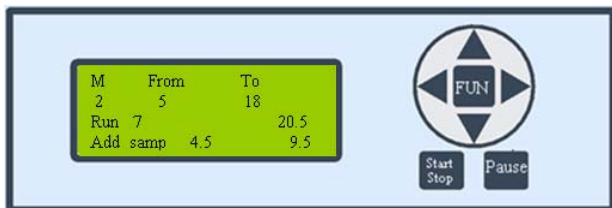
### 2.1 Multi functional platform

Depending on the configurations, a SPE-04 can perform offline solid phase extraction, online solid phase extraction, online derivatization, and direct injection to HPLC. The online derivatization function is very useful for analysis of amino acids, hormones, and some pesticides.

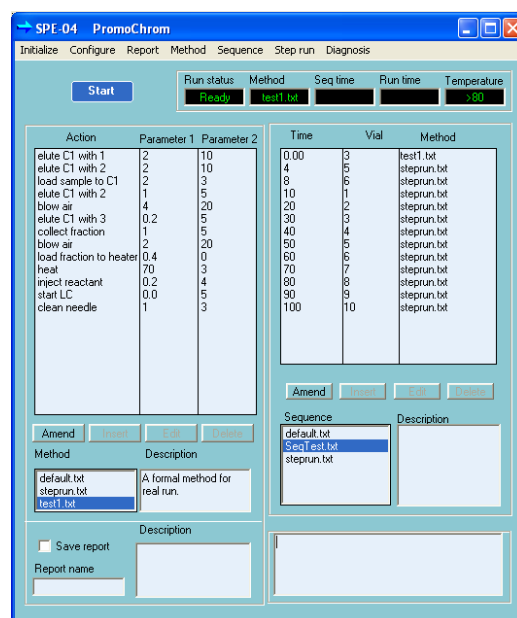


## 2.2 Easy operation

SPE-04 uses built-in methods to do offline SPE. It does not need a computer. The operation of instrument involves only 7 buttons. The operation procedures of the offline SPE is the same as SPE-01 and SPE-03.



The screen indicates samples 5 to 18 are to be processed using method 2. It is now processing sample 7. The total volume per sample is 20.5 mL. Currently the instrument is performing add sample action.



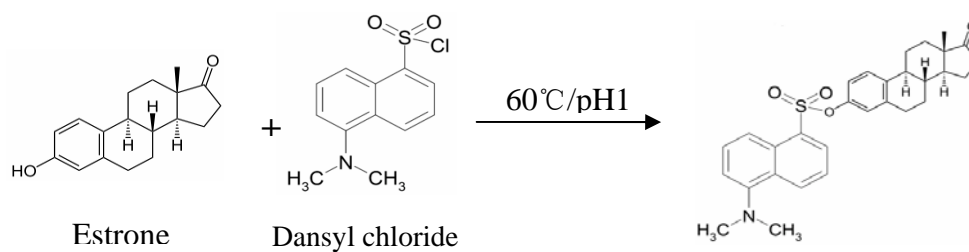
In online mode, the collected fraction is directly injected into an HPLC or LC-MS for final determination. The control software for online SPE is user friendly and is compatible with most HPLC software. The software uses methods and sequences for the automation. It has similar structure as Agilent Chemstation. Users of HPLC can easily understand the SPE-04 software.

The software can perform overlapped injection. When HPLC is performing an HPLC run, SPE-04 can start processing the next sample.

### 3. Applications

Direct analysis of hormone in plasma sample:

- 1) Dilute plasma sample with 1% phosphoric acid at 1:5 ratio
- 2) Precondition a 3-mL/200-mg C18 SPE column with 2 mL methanol followed by 2 mL water
- 3) Load 2 mL sample and wash with 4 mL water+methanol (80:20)
- 4) Wash SPE column using methanol and collect 1 mL fraction
- 5) Derivatize the fraction with dansyl chloride at 60 °C
- 6) HPLC analysis using a PCTsil C18 column and UV or fluorescence detection.



## 4. Specifications

	Offline model	Online model
Sample capacity	18, 26 or 38 per batch	18, 26 or 38 per batch
Maximum sample volume	4, 8 or 20 mL	4, 8 or 20 mL
Material of wetted parts	Teflon, stainless steel, Pyrex glass	Teflon, stainless steel, Pyrex glass
System control	Micro controller with LCD and keypad	Computer or micro controller with LCD and keypad
Method functions	Pre condition, load sample, elution with 5 solvents, fraction collection	Pre condition, load sample, elution with 5 solvents, blow dry of sorbent, fraction collection, injection into HPLC.
Temperature for derivatization		Ambient to 80 °C
Type of derivatization reagent		2
Pump flow rate	1 to 30 mL/min	1 to 30 mL/min
Pressure limit of pump	6 bar	6 bar
Pump reproducibility (C.V.%)	<1.5	<1.5
Power supply	24 VDC	24 VDC
Current	< 1 A	< 1 A
Weight	12 Kg	12 Kg
Dimension (cm)	34 x 42 x 35 cm (width x depth x height)	34 x 42 x 35 cm (width x depth x height)

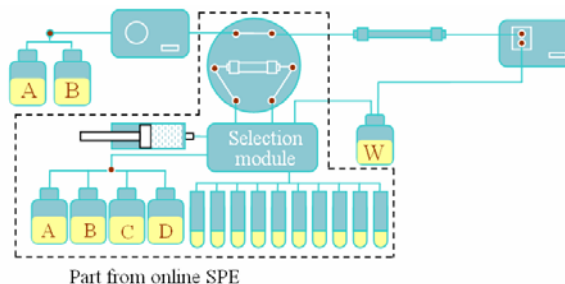
## 5. Order information

Part No.	Description	Price (US\$)
SPE-04-01	Includes SPE-04 offline mainframe (no online SPE function), 24V power supply, and user manual	
SPE-04-02	Includes SPE-04 mainframe, sample injection module for HPLC, control software, remote cable for HPLC, 24V power supply, and user manual.	
SPE-04-03	Includes SPE-04 mainframe, sample injection function for HPLC, online derivatization module, and control software, remote cable for HPLC, 24V power supply, and user manual.	



## LC-03 Online SPE for Direct Analysis of Liquid Samples

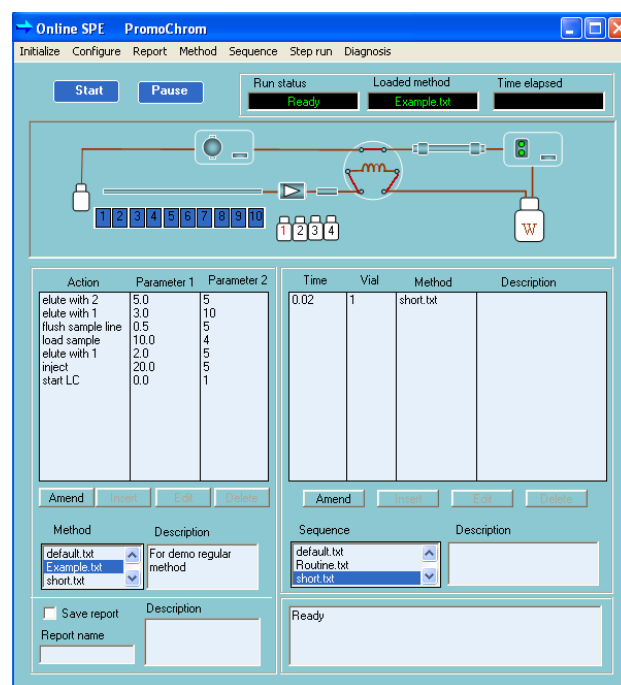
**Online SPE** is for direct analysis of water samples. It combines sample extraction and LC or LC-MS analysis.



### 1. Working principle

The online SPE uses valves and a syringe pump to transfer sample to SPE column and then to the HPLC system.

The control software looks after the detailed valve switches. Users only need to select the necessary actions. Such as “load sample”, “add reagent 1”, “inject”, “start LC”, etc. The device uses remote signal to trigger start of HPLC. While the HPLC is running a sample, online SPE can carry out extraction of next sample. The overlapped introduction saves the time for sample preparation.



Below is a typical working cycle:

- 1) Conditioning of the extraction column. The stream selection valve is diverted to an elution solvent, the syringe pump transfers the solvent to the extraction column.
- 2) Load sample. The stream selection valve is diverted to a sample container. The syringe pump add the sample to the extraction column.
- 3) Elution the extraction column to remove interference. The stream selection valve is connected to an solvent again and the syringe pump uses the solvent to rinse the extraction column.
- 4) Inject sample to HPLC. The 2-position injection valve is switched from load position to inject position.
- 5) The SPE system send a trigger signal to HPLC. The mobile phase from HPLC carries the sample from the extraction column to the analytical column and start the HPLC analysis.

## **2. Features**

### **2.1 Easy operation**

The online SPE system has a very user friendly software. The diagram displays the liquid path in a real time manner. The command is straight forward.

### **2.2 Stand alone operation**

The online SPE can be controled using keypad, it is not necessary to install software for most applications. This feature makes it easy to move from one LC to another without disturbing the analytical system.

### **2.3 Overlapped sample preparation**

When HPLC or LC-MS is analyzing a sample, LC-03 will start processing the next sample. It helps to save time in sample preparation.

### **2.4 Easy integration with HPLC**

The instrument provides a remote port to trigger start /stop of HPLC. It can be used with any HPLC or LC-MS that has a remote input port.

## **3. Applications**

Below is an example for direct analysis of polycyclic aromatic hydrocarbons (PAH) in tap water at ppt level. A 40-mL tap water is analyzed directly. Since the whole portion of the sample is injected to the analytical column, the detection limit can go down to 5 ppt without using fluorescence detection. By using the overlapped injection feature, the processing time for one sample is only 15 minutes.

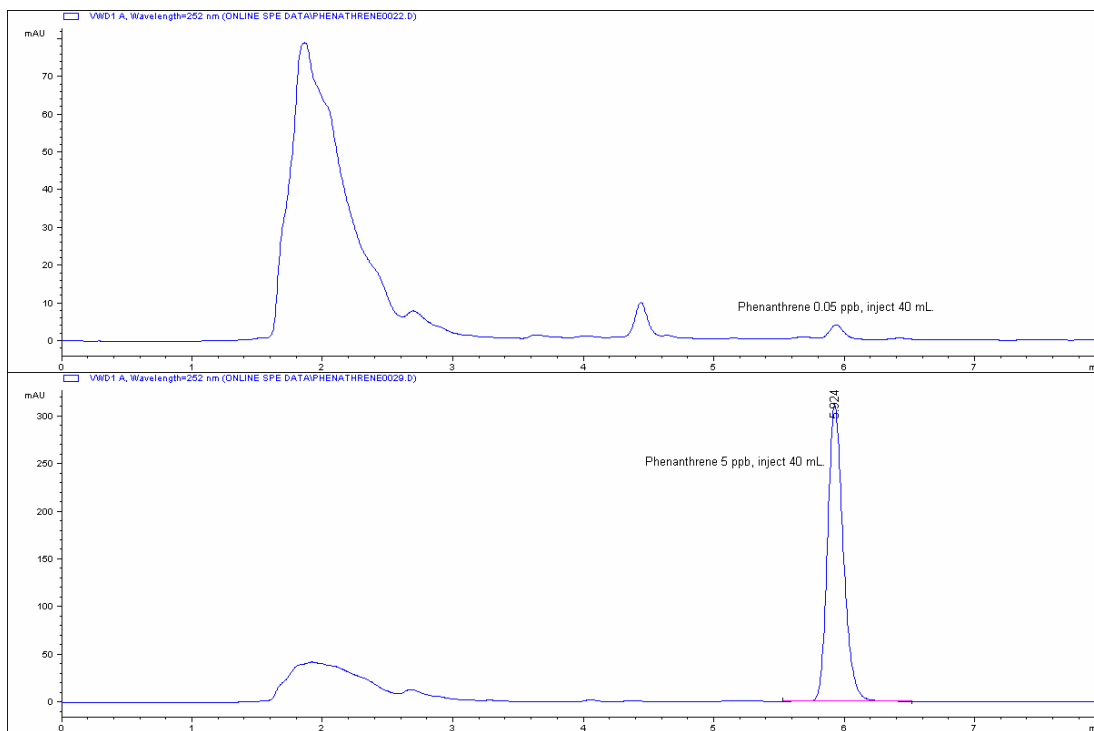
In an offline approach, normally 500 to 1000 mL water need to be extracted. Further concentration and solvent exchange are followed before the instrument analysis. Only a very small portion of the concentrated sample is injected to the HPLC. To achieve similar detection limit of online SPE, 4-liters of water need to be extracted. The processing time for one sample is above 1 hour.

Another advantage of online SPE over offline SPE is its good reproducibility. Since online SPE involves fewer procedures than the offline approach and all these procedures are controlled by instrument, the chance of error is much less. Even at 0.05 ppb level, the %RSD is only 2.5 (n=3).

Therefore, if the pollutant can be analyzed by HPLC, the online approach should be used.

The key for a successful application of online SPE is the selection of a suitable SPE column and the analytical column. To simplify the method development, PromoChrom provides two method kits with

well matched SPE column and the analytical column. They also include the method parameters for most common analysis. By slightly adjusting the parameters, users can easily development their own methods.



Direct analysis of phenanthrene in tap water at 5 ppb and 50 ppt level using online SPE coupled with HPLC. SPE column, TrapN; analytical column PromSil C18; sample volume, 40 mL; flow rate for sample loading, 6 mL/min; detection wavelength, 252 nm.

#### 4. Specifications

Number of samples	10
Volume of sample (mL)	1-100
Number of elution solvents	4
Pump reproducibility (C.V.%)	< 1.5
Pressure limit of pump	10 bar
Material of wetted parts	Stainless steel, Teflon, PEEK, special glass
System control	Software via computer
Power supply	24 VDC
Current	< 1 A
Weight	4.0 Kg
Dimension	16.5 x 22x 26 cm (width x depth x height)

#### 5. Ordering Information

Part Number	Description	Price (US\$)
LC-03-01	Online SPE. Include hardware, control software, USB/RS232 converter, and 24V power supply.	
LC-03-03	Method kit for compounds of low polarity (Include 5 TrapN SPE column, one analytical column, and methods)	
LC-03-04	Method kit for compounds of high polarity (Include 5 TrapP SPE column, one analytical column, and methods)	

## SPE-06 Mini SPE

SPE-06 miniSPE is a flexible and versatile device for automated solid phase extraction. In spite of its small size and much lower cost than other automated SPE instruments, SPE-06 can perform all actions of SPE, such as column conditioning, sample loading, elution, and fraction collection. SPE-06 has two configurations. Configuration 1 can handle up to 4 samples. Configuration 2 can handle 2 samples and can make elution of SPE columns in two directions

### 1. Features

#### 1.1 Easy operation

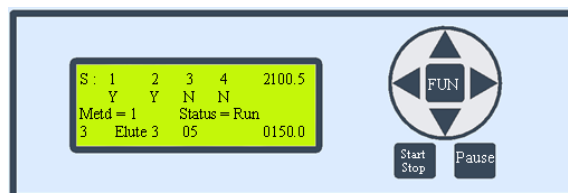
SPE-06 uses built-in methods. They can be easily edited. The operation of instrument involves only 7 buttons. Below is a typical routine operation procedure:

- Place sample tubes and add samples
- Install columns and collection vials
- Select method
- Press the start/stop button.

The instrument will process the samples automatically according to the selected method.



When the device is processing samples, its status is closely monitored and indicated. As shown in the screen on the right, it indicates that sample 3 is being processed using method 1. The total volume per sample is 2100.5 mL and 150 mL has been processed. Currently the instrument is running the step of elution using solvent 3.



The built-in methods use very simple commands and can be easily modified. Below is an example of a method.

Line #	Action	Flow rate	Volume	Remarks
1	Elute 1	15	5.0	Use 5 mL solvent 1 to wash column
2	Elute2	15	4.0	Use 4 mL solvent 2 to wash column
3	Add samp	6	20.0	Load 20 mL sample at 6 mL/min flow rate
4	Rinse 2	6	1.0	Use 1 mL solvent 2 to rinse sample tube and add rinsate to column
5	Elute 3	6	0.0	Change elution solvent to solvent 3
6	Collect	6	10.0	Elute using solvent 3 and collect 10 mL fraction

## 1.2 Column blockage detection and smart handling

The device can detect the blockage of SPE columns and reduce the flow rate accordingly. If blockage still occur, the instrument will pause to wait for human attendance.

## 1.3 Small footprint and simple structure due to flow path integration technique

Thanks to the flow-path-integration technique, SPE-06 has a very simple and a very small size (16.5 x 22x 26 cm). Its weight is below 3 Kg. It can be easily carried and may be used for on-site sampling.

## 1.4 Use of various SPE columns and containers

SPE-06 uses an innovative general purpose adapter to deal with variations in diameter of SPE columns. These adapters can be easily adjusted when different type columns are used. It is not necessary to use extra caps or adapters for different columns.

The device can use various types of containers for sample and fractions, such as Erlenmeyer flasks, beakers, and test tubes. The containers can be capped to prevent solvent evaporation .



## 2. Specifications

Sample capacity	4 samples per batch (sequential process)
Sample volume	1 ~ 2000 mL
Number of fraction	1 fraction per sample
Type of elution solvent	4
Solvent wetted material	316 stainless steel, Teflon), and Pyrex glass.
Control	Micro controller control with keypad input and LCD display
Method	Permanently store 3 editable methods
Pump flow rate	1~ 60mL/min
Pump precision (CV%)	<1.5
Power supply	24 VDC
Current	< 1 A
Weight	2.5 Kg
Dimension	16.5 x 22x 26 cm (W x D x H)

## Order information

Product Number	Description	Price (US\$)
SPE-06-01	Include SPE-01 mainframe, 24V power supply, and user manual	

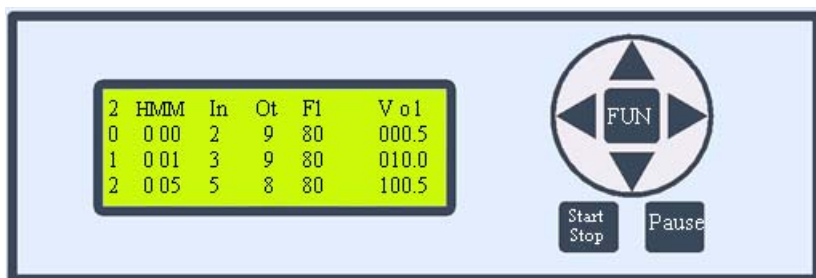
## LC-07 multi channel syringe pump

LC-07 consists of a syringe pump and a stream selection valve. It can deliver liquids from one location to another accurately and automatically. With the built-in program, LC-07 can be used to make a set of standard solutions or deliver chemical reagents to a chemical reactor according to pre set time.

Its operation involves only 7 buttons. Like other instruments from PromoChrom, the operation of LC-07 is simple and very user friendly. Users can command the use of the device quickly by referring to the user manual. A routine operation procedures only involves 3 steps:

- 1) place the containers
- 2) Select the method
- 3) Press the “Start’ button

The device will complete the work automatically.



LC-07 uses built-in methods to achieve automatic liquid delivery. The meaning of the method is straight forward (refer to the above picture). Each step in a method can set timing, intake port, output port, pump flow rate and volume. Up to 16 steps can be set in a method.

The device use most inert material for solvent contact parts (Teflon, 316 stainless steel, and Pyrex glass). They are compatible to most aggressive solvents.

## 1. Applications

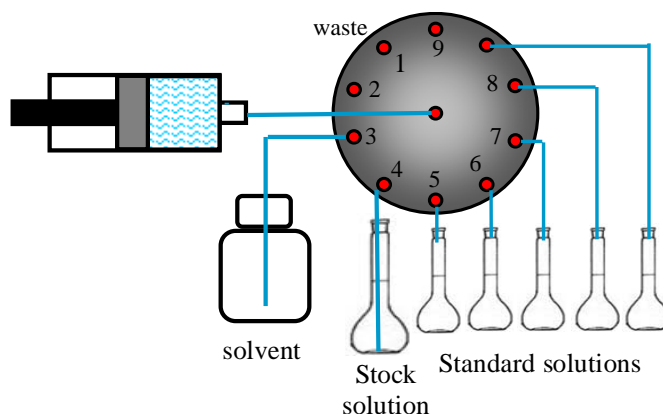
### 1.1 Automatic preparation of standard solutions

Making standard solutions is a routine work for an analytical laboratory. Its accuracy decides the quality of the analytical data. It is time consuming and need skillful personnel. A LC-07 can fulfill the tasks automatically.

The following example demonstrates how to make a series of 5 standard solutions from a 100 ug/mL stock solution. The concentration of the 5 standard solutions is 1, 2, 5, 10, and 20 ug/mL. The volume of the 5 solutions is 50 mL.



1) Set up the device as following



2) Build a method as shown in the following table (only necessary for the first time)

	HMM	In	Ot	Fl	Vol	Remarks
0	000	4	1	50	1	Fill the tubing between valve and stock solution
1	000	3	1	50	5	Fill the tubing between valve and solvent
2	000	4	5	50	10	Add stock solution for 20 ug/mL standard
3	000	3	5	50	40	Add solvent for 20 ug/mL standard to make 50 mL
4	000	4	6	50	5	Add stock solution for 10 ug/mL standard
5	000	3	6	50	45	Add solvent for 10 ug/mL standard to make 50 mL
6	000	4	7	50	2.5	Add stock solution for 5 ug/mL standard
7	000	3	7	50	47.5	Add solvent for 5 ug/mL standard to make 50 mL
8	000	4	8	50	1	Add stock solution for 2 ug/mL standard
9	000	3	8	50	49	Add solvent for ug/mL standard to make 50 mL
10	000	4	9	50	0.5	Add stock solution for 1 ug/mL standard
11	000	3	9	50	49.5	Add solvent for 1 ug/mL standard to make 50 mL

3) Press “Start” button. The device will complete all the preparation work in around 10 minutes.

## 1.2 Addition of reagents to a chemical reactor

Timing and speed of adding reagents to a chemical reactor are critical to the yield of a chemical reaction. These two factors can be controlled automatically using a LC-07.

Sometimes a multi step synthesis need to change the conditions drastically. For example, a synthesis need to be carried out at -5 °C for first reaction and then change temperature to over 100 °C for the second reaction. This change may be achieved automatically also using a LC-07 and two reactors. Below is a demonstration of the setting, which involves addition of 4 reagents and two reaction stages. The reactor 1 is maintained at low temperature and reactor 2 is maintained at high temperature.

## 2. Specifications

Number of valve ports	10 or 18
Delivery volume (mL)	0.5~5000
Flow rate (mL/min)	0.1~90
Delivery reproducibility (C.V.%)	< 0.5
Delivery accuracy (%)	< 1
Maximum output pressure (Bar)	6
Wetting materials	Teflon, 316 stainless steel, and Pyrex glass
Control	Built-in micro controller with keypad entry
Power consumption (Watt)	< 12
Weight (Kg)	2.5
Dimension (cm)	16.5 x 22x 26

## 3. Order information

Part number	Description	Reference price (US\$)
LC-07-01	Include a LC-07 mainframe with 10-port valve, 24 volt power supply, and user manual.	
LC-07-02	Include a LC-07 mainframe with 18-port valve, 24 volt power supply, and user manual.	

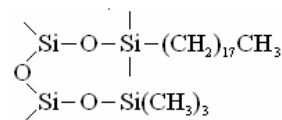
**PromoChrom Silica Based Sorbents – C18, C8, NH<sub>2</sub>, PSA, SAX, SCX, COOH**

Made of high quality spherical and pure silica particles  
Sorbent surface is specially modified to ensure high sample recovery and good reproducibility

**Average particle diameter:** 45 µm  
**Average Pore Size:** 60 Å  
**Pore Volume:** 0.8 cm<sup>3</sup>/g  
**Specific Surface Area:** 480 m<sup>2</sup>/g

**C18 (Endcapped) SPE Cartridge**

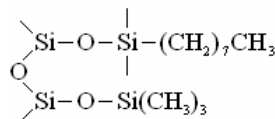
Description	Tubes/Box	Part Number	Price (US\$)
100 mg, 1 mL	100	18-010-1-C	108
200 mg, 3 mL	50	18-020-3-C	75
500 mg, 3 mL	50	18-050-3-C	88
500 mg, 6 mL	30	18-050-6-C	68
1000 mg, 6 mL	30	18-100-6-C	85



Structure of C18 silane and trimethyl silyl endcapping group, covalently bonded to the surface of a silica particle.

**C8 SPE Cartridge**

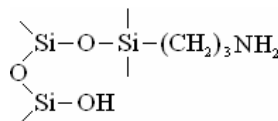
Description	Tubes/Box	Part Number	Price (US\$)
100 mg, 1 mL	100	08-010-1	108
200 mg, 3 mL	50	08-020-3	75
500 mg, 3 mL	50	08-050-3	88
500 mg, 6 mL	30	08-050-6	68
1000 mg, 6 mL	30	08-100-6	85



Structure of C8 octyl silane and trimethyl silyl endcapping group, covalently bonded to the surface of a silica particle.

**NH<sub>2</sub> Aminopropyl SPE Cartridge**

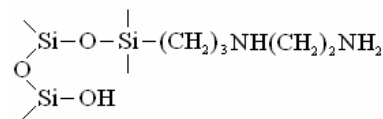
Description	Tubes/Box	Part Number	Price (US\$)
100 mg, 1 mL	100	NH-010-1	108
200 mg, 3 mL	50	NH-020-3	75
500 mg, 3 mL	50	NH-050-3	88
500 mg, 6 mL	30	NH-050-6	58
1000 mg, 6 mL	30	NH-100-6	85



Structure of amino (NH<sub>2</sub>) silane, covalently bonded to the surface of a silica particle.

**PSA (N-aminoethyl) Aminopropyl SPE Cartridge**

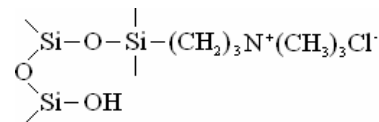
Description	Tubes/Box	Part Number	Price (US\$)
100 mg, 1 mL	100	PA-010-1	108
200 mg, 3 mL	50	PA-020-3	85
500 mg, 3 mL	50	PA-050-3	88
500 mg, 6 mL	30	PA-050-6	58
1000 mg, 6 mL	30	PA-100-6	85



Structure of PSA silane, covalently bonded to the surface of a silica particle.

### SAX (Strong Anion Exchanger) SPE Cartridge

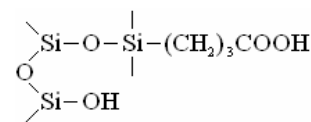
Description	Tubes/Box	Part Number	Price (US\$)
100 mg, 1 mL	100	SA-010-1	108
200 mg, 3 mL	50	SA-020-3	88
500 mg, 3 mL	50	SA-050-3	108
500 mg, 6 mL	30	SA-050-6	78
1000 mg, 6 mL	30	SA-100-6	118



Structure of SAX silane, covalently bonded to the surface of a silica particle.

### COOH (Weak Cation Exchanger) SPE Cartridge

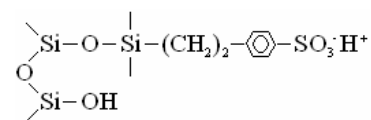
Description	Tubes/Box	Part Number	Price (US\$)
100 mg, 1 mL	100	CH-010-1	108
200 mg, 3 mL	50	CH-020-3	88
500 mg, 3 mL	50	CH-050-3	108
500 mg, 6 mL	30	CH-050-6	78
1000 mg, 6 mL	30	CH-100-6	118



Structure of propyl carboxylic acid (COOH) silane, covalently bonded to the surface of a silica particle.

### SCX (Strong Cation Exchanger) SPE Cartridge

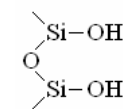
Description	Tubes/Box	Part Number	Price (US\$)
100 mg, 1 mL	100	SC-010-1	108
200 mg, 3 mL	50	SC-020-3	88
500 mg, 3 mL	50	SC-050-3	108
500 mg, 6 mL	30	SC-050-6	78
1000 mg, 6 mL	30	SC-100-6	118



Structure of SCX silane, covalently bonded to the surface of a silica particle.

### Silica SPE Cartridge

Description	Tubes/Box	Part Number	Price (US\$)
100 mg, 1 mL	100	SI-010-1	90
200 mg, 3 mL	50	SI-020-3	68
500 mg, 3 mL	50	SI-050-3	78
500 mg, 6 mL	30	SI-050-6	54
1000 mg, 6 mL	30	SI-100-6	70



Structure of silanol groups on the surface of a silica particle.

## PromoChrom Sorbents for pesticide residue analysis

### PestiCarb SPE Cartridge

Description	Tubes/Box	Part Number	Price (US\$)
200 mg, 3 mL	50	PC-020-3	120
500 mg, 3 mL	50	PC-050-3	168
500 mg, 6 mL	30	PC-050-6	130
1000 mg, 6 mL	30	PC-100-6	190

Graphitized Carbon Black

Average particle size: 120~400 mesh

Specially for sample cleanup in pesticide residue analysis

*Alternative to Supelco Envicarb*

### PestiCarb/NH2

Description	Tubes/Box	Part Number	Price (US\$)
500mg/500mg, 6 mL	30	PCNH-050-6	210

Two layer sorbents isolated with a frit. Effectively remove pigments and organic acids from plant samples. Widely used for sample cleanup in pesticide residue analysis.

*Alternative to Supelco Envi-Carb/NH2*

### PestiCarb/PSA SPE Cartridge

Description	Tubes/Box	Part Number	Price (US\$)
500mg/500mg, 6 mL	30	PCPA-050-6	210

Two layer sorbents isolated with a frit. Effectively remove pigments and organic acids from plant samples. Widely used for sample cleanup in pesticide residue analysis.

*Alternative to Supelco Envi-Carb/PSA*

### Sorbent for dispersive SPE (QuEChers)

Description	Quantity (g)	Part Number	Price (US\$)
Pesticarb	10	SBPC-010	90
Pesticarb	100	SBPC-100	750
Silica bonded with PSA	100	SBPA-100	160

Pesticarb:

Graphitized Carbon Black

Average particle size: 120~400 mesh

Silica bonded with PSA:

Silica 40-60 um, bonded with primary secondary amine.

## **Terms and Conditions**

### **Price**

Prices in this catalog are for reference only and may change without notice. The prices do not include tax and costs on shipping and handling. Please ask PromoChrom or an authorized distributor for a quotation before placing your order.

### **Design Changes**

Due to continuing improvements in design, some items may differ slightly from the descriptions and photographs. Specifications are subject to change without notice.

### **Warranties**

The warranty period for instruments is one year. If notice of defects is received within the warranty period, PromoChrom shall, at its option, either repair or replace the defective products. If PromoChrom is unable to repair or replace the defective products within a reasonable time, buyers shall receive refund of the purchase price upon return of the products. The warranty for defects is limited to the purchase price of the product. In no event shall PromoChrom Technologies be liable for incidental or consequential damages in connection with the furnishing, performance, or use of the products.



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